HPC Resources, Teaching, and Training

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Many/Multi-Core Research Group

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http://cse.mrt.ac.lk/hpc/

Resources at Moratuwa

- **GPUs**
  - 52 Nvidia Geforce GTX 480 cards
    - 480 cores, 0.7 GHz, 1.5 GB RAM
    - 4 + 10 – Electronics & IT Faculty
  - 1 Nvidia Tesla 2070
    - 448 cores, 1.15 GHz, Double precision FP, 3 GB RAM
- **CPU**
  - 3 Intel i7s
    - Quad core, 3 GHz, 8 GB RAM, 500 GB HDD
    - 2 GPUs each
  - 2 Intel
    - Quad core, 2.66 GHz, 16 GB RAM, 400 GB HDD
  - Several workstations

Resources at Other Places

- **University of Colombo – UCSC**
  - GPUs
    - 7 Nvidia Geforce GTX 480 cards
    - 1 Nvidia Tesla 2050 card
  - Cluster
    - 8 Intel i7 – Quad core, 4 GB RAM
    - 5 GPUs installed
- **University of Peradeniya**
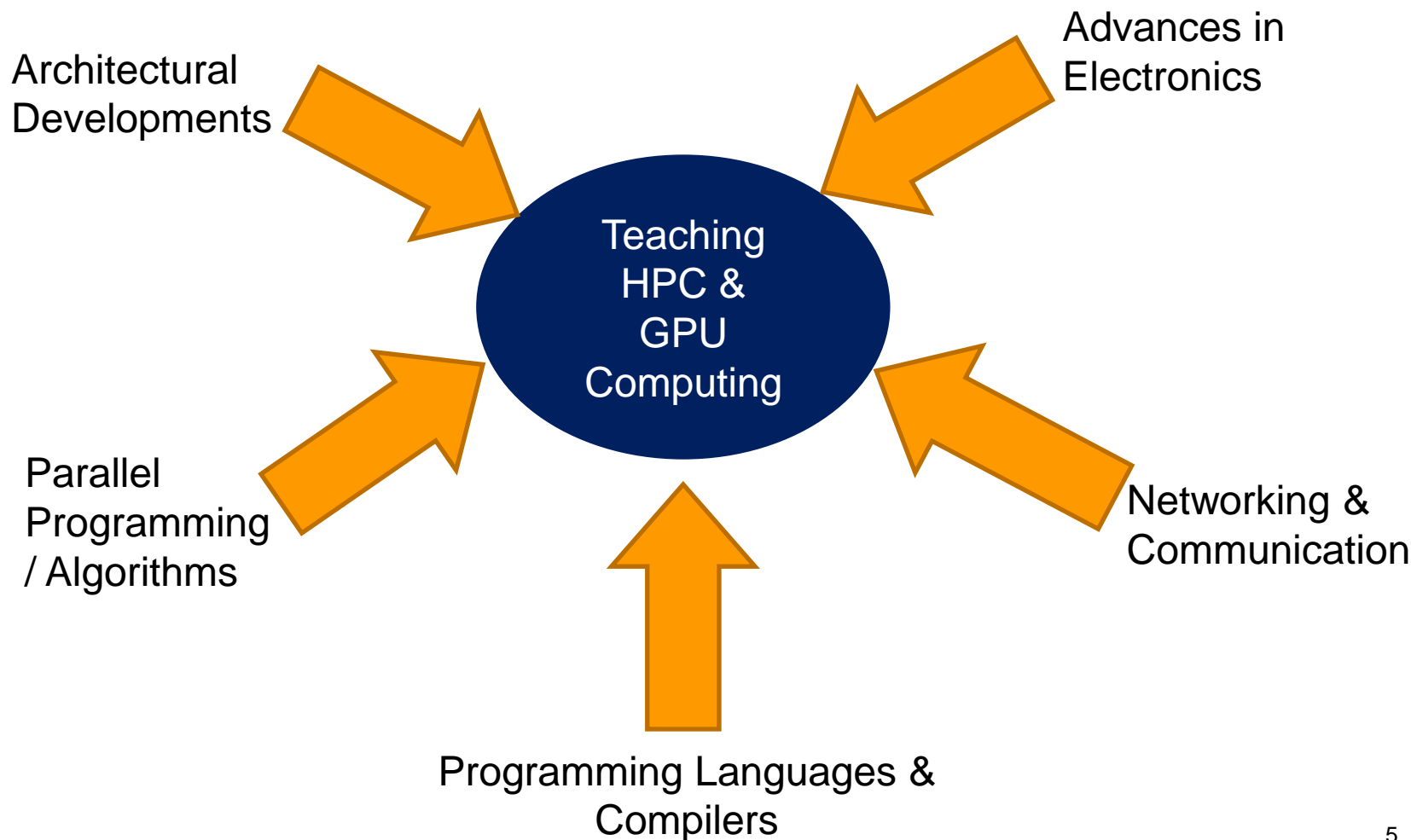 - Few Nvidia GPUs

Access to Resources

- ❑ Remote access
  - ■ CPU/GPU access to 4 users from UoC
  - ■ CPU access to 1 user from Indiana University
  - ■ Data transfer
    - ❑ ≤ 500 MB – online
    - ❑ > 500 MB – USB flash drives or portal disks
- ❑ Short-term borrowing of GPUs
  - ■ Internal borrowing
  - ■ Can extend to external parties

Teaching HPC & GPU Computing

Architectural Developments

Advances in Electronics

Teaching HPC & GPU Computing

Parallel Programming / Algorithms

Networking & Communication

Programming Languages & Compilers

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Source – Dr. Lochandaka Ranathunga, University of Moratuwa

Core Knowledge Areas

- ❑ Sequential vs. Parallel programming
  - ■ Parallel algorithms & complexity
  - ■ Language specific implementations
    - ❑ e.g., PThreads, OpenMP, MPI, CUDA
- ❑ Computer architecture, performance, & Amdahl's Law
  - ■ Knowing how to program isn't sufficient!
  - ■ Flynn's Taxonomy & Current Trends
  - ■ Architectural & Memory Models
  - ■ Performance limitations

Student Programs at Moratuwa

- ❏ Faculty of IT
  - ■ Parallel Processing (52 students)
    - ❏ Used GPUs & CUDA
  - ■ High Performance Computing (53 students)
    - ❏ Other programming techniques (PVM, MPI, OpenMP)
    - ❏ More emphasize on architectural developments
    - ❏ Some CUDA
- ❏ Faculty of Engineering
  - ■ Concurrent Programming (BSc) & Parallel & Concurrent Programming (MSc)
    - ❏ Discussions on GPU for last 3 years
    - ❏ Integrated UDACITY course this year
      - ■ www.udacity.com/course/cs344
  - ■ Scientific Computing (BSc) & Graphics Processing Units (MSc)
    - ❏ Hands on Many/Multi-Core systems

Training

- ❑ Online resources
  - ▪ UDACITY course on Introduction to Parallel Programming
    - ❑ www.udacity.com/course/cs344
  - ▪ NVIDIA Developer Zone
    - ❑ https://developer.nvidia.com/category/zone/cuda-zone
- ❑ Workshops & Short Courses
  - ▪ MSc classes as short courses
- ❑ Short-term training at Moratuwa
  - ▪ Graduate students & faculty
- ❑ Collaborative interdisciplinary research
  - ▪ Training, code optimization, co-development
  - ▪ Forum for sharing ideas
    - ❑ Many/Multi-Core Research Group at Moratuwa

Discussion Points

- How can we work together?
  - Resource sharing/collaboration
  - Curriculum development
  - Training
  - Collaborative interdisciplinary research
  - Collaborative funding opportunities
- Need for a national (centralized/distributed) research computing facility?